

Sean P.F. Casey

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EDUCATION

TEXAS A&M UNIVERSITY

College Station, TX

Doctor of Philosophy, Atmospheric Science December 2009
Dissertation: *Tropical Midtropospheric Relative Humidity and Cumulus Congestus Clouds: A Multi-Satellite Analysis*
Adviser: Andrew E. Dessler, Ph.D.

Master of Science, Atmospheric Science August 2007
Thesis: *The Frequency of Tropical Precipitating Clouds as Observed by the TRMM PR and ICESat/GLAS*
Adviser: Andrew E. Dessler, Ph.D.

UNIVERSITY OF WASHINGTON

Seattle, WA

Bachelor of Science with College Honors June 2005
Major: Atmospheric Science
Minors: Applied Mathematics, Earth and Space Sciences
Honors Program

RESEARCH EXPERIENCE

JET PROPULSION LABORATORY

Pasadena, CA

Caltech Postdoctoral Scholar at JPL 2010-present

- Continued analysis of tropical congestus clouds as viewed by CloudSat CPR, and the surrounding environment as viewed by AIRS
- Investigated validation of convective buoyancy determination methods, using Kwajalein Atoll ground radar and Global Infrared Geostationary Composite data
- Utilized ISCCP cloud identification data to compare with CloudSat cloud class identification

TEXAS A&M UNIVERSITY

College Station, TX

Department of Atmospheric Science
Ph.D. candidate, Graduate Research Assistant 2007-present
M.S. candidate, Graduate Research Assistant 2005-2007

- Utilized a number of satellite instruments for meteorological research, including:
 - TRMM PR

- ICESat/GLAS
- *Aqua* AIRS
- *Aqua* MODIS
- CloudSat CPR
- Assisted Dr. Gary Morris and team from Rice University with College Station, TX ozonesonde launches

UNIVERSITY OF WASHINGTON **Seattle, WA**
Department of Atmospheric Science, Mesoscale Group
Undergraduate Research Assistant 2002-2005

- Processed TRMM PR and Kwajalein Atoll Ground Radar for use by Dr. Robert Houze and other Mesoscale Group members

TEACHING EXPERIENCE

TEXAS A&M UNIVERSITY **College Station, TX**
Department of Atmospheric Science
Instructor-Atmospheric Science Lab (ATMO 202) Fall 2008
Teaching Assistant-Weather Observation and Analysis (ATMO 251) Fall 2008
Teaching Assistant-Atmospheric Dynamics (ATMO 336) Fall 2006

REFEREED PUBLICATIONS

- Casey, S.P.F., A.E. Dessler, and C. Schumacher, 2009: Five-year climatology of midtroposphere dry air layers in warm tropical ocean regions as viewed by AIRS/Aqua. *J. Appl. Met. Clim.*, in press.
- Casey, S.P.F., A.E. Dessler, and C. Schumacher, 2007: Frequency of tropical precipitating clouds as observed by the Tropical Rainfall Measuring Mission Precipitation Radar and ICESat/Geoscience Laser Altimeter System. *J. Geophys. Res.*, 112, D14215, doi:10.1029/2007JD008468.

PAPERS IN PROGRESS

- Casey, S.P.F., E.J. Fetzer, and Q. Yue, 2010: Regional differences in congestus populations and the surround environment. *In Preparation.*
- Casey, S.P.F., and E.J. Fetzer: Revised identification of tropical oceanic cumulus congestus as viewed by CloudSat. *In Preparation.*

PRESENTATIONS

- Second A-Train Symposium, New Orleans, LA, October 2010
13th Conference on Cloud Physics, Portland, OR, June-July 2010

Gordon Research Conference on Radiation and Climate, New London,
NH, July 2009
Climate, Statistics, and Satellites: A Symposium in Honor of Gerald
North, College Station, TX, June 2009
NASA Sounding Science Team Meeting, Pasadena, CA, May 2009
16th Conference on Satellite Meteorology and Oceanography, 89th
American Meteorological Society Annual Meeting, Phoenix, AZ,
January 2009
28th Conference on Hurricanes and Tropical Meteorology, Orlando, FL,
April-May 2008
Third NASA/JAXA International TRMM Science Conference, Las
Vegas, NV, February 2008
33rd Conference on Radar Meteorology, Cairns, QLD, Australia, August
2007

FELLOWSHIPS AND AWARDS

NASA Earth System Science Graduate Fellowship	2006-2009
Om & Saraswati Bahethi Scholarship, American Meteorological Society	2004-2005
Atmospheric Sciences Anonymous Endowed Fund Scholarship	2003
UW Undergraduate Scholar Award	2002-2003
UW Achievement Award	2001-2002

SERVICE/OUTREACH

Reviewer, <i>Monthly Weather Review</i>	2009
Reviewer, <i>Journal of Applied Meteorology and Climatology</i>	2007-2009
Treasurer, Atmospheric Sciences Graduate Council	2007-2009
Reviewer, <i>Journal of Geophysical Research- Atmospheres</i>	2008

Statement of Research Interests

My past and present research experience has mostly focused on the fields of tropical meteorology, satellite meteorology, and cloud physics. A major theme through my research has been analysis of the trimodal distribution of tropical convection (Johnson et al. 1999): shallow clouds with cloud-top heights near 2 km above the surface, mid-level congestus clouds with tops near the 0°C level, and deep convective clouds capped by the tropopause. For my Masters research, I showed that this trimodal distribution was visible in cloud data from the Geoscience Laser Altimeter System (GLAS), carried aboard the Ice, Cloud, and land Elevation Satellite (ICESat), as well as in precipitation data from the Tropical Rainfall Measuring Mission (TRMM) Precipitation Radar (PR). Using these, I calculate the fractional areal coverage (FAC) at each of the three levels to describe how often optically thick clouds or precipitation are seen at each level.

From here, my research turned to identifying the capping mechanism for cumulus congestus clouds. It had been postulated (Redelsperger et al. 2002, Jensen and Del Genio 2006, Zuidema et al. 2006) that low values of relative humidity in the midtroposphere prevented these clouds from continuing to rise to the tropopause due to mixing of moist and dry air at the top of the cloud. To understand these midtroposphere dry layers, I analyzed five years of relative humidity (RH) observations from the Atmospheric Infrared Sounder (AIRS) instrument aboard the *Aqua* satellite to identify areas of anomalously dry air between 600 and 400 hPa over deep convective regions of the tropical oceans.

Currently I'm working on two studies to round out this dry layer/congestus analysis. First, I'm looking at how to reconcile the need to study true congestus with the "snapshot" nature of satellite meteorology. Cloud-top heights are measured as CloudSat/CALIPSO pass over the location; these clouds may be in the process of growing to much higher heights when this "snapshot" is taken. Luo et al. [2009] noted the need to separate out terminal congestus, or congestus that ceases growth at intermediate levels, from transient congestus, congestus that continues to rise to higher altitudes. However, the method described in Luo et al. [2009] has not been properly validated. I am working on verifying the terminal/transient separation suggested by this study using overpasses over the Kwajalein Atoll ground radar. These are also being compared with the 4-km-resolution global infrared geostationary composite data, to test the effectiveness of using geostationary satellites to track lifecycle.

Secondly, I return to the question of the relation between midtropospheric relative humidity and cumulus congestus clouds. Cloud data from the CPR and mixing ratio data from AIRS have been collocated by the AIRS science team for January 2007. Because *CloudSat* passes over an area already sampled by *Aqua* one minute prior, this provides near-simultaneous measurements to compare. The greater footprint of the AIRS instrument samples the environment around a CloudSat pixel, giving a localized humidity profile for the region. My current work has noticed a five-fold increase in relative congestus cloud populations in the North Pacific Intertropical Convergence Zone (ITCZ) region compared to the other oceanic basins. Associated with these higher congestus counts are lower water vapor amounts (on the order of 25-30%) in the midtroposphere surrounding congestus clouds in the north Pacific than in the west Pacific. This lends credence to the idea that dry air layers in the midtroposphere may lead to more congestus clouds in the North Pacific, a region where Casey et al. [2009] noted large occurrences of these dry air layers.

References

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